

REMARKS

I. DOUBLE PATENTING

Claims 1 to 11 of the above-identified U.S. Patent Application were provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1 to 11 of co-pending application No.10/806,761.

Claims 1 to 11 of this application have been amended, so that independent claim 1 of this application is no longer of the same scope as claim 1 of application Ser. No. 10/806,761. The amended claim 1 of this application claims a species of the article claimed by claim 1 of Ser. No. 10/806,761, which may be patentable over the article claimed by claim 1 of Ser. No. 10/806,761.

For the foregoing reasons and because of the changes in claims 1 to 11 of the present application withdrawal of the provisional double patenting rejection of claims 1 to 11 under 35 U.S.C. 101 based on claims 1 to 11 of copending U.S. Patent Application Ser. No. 10/806,761 is respectfully requested.

II. INDEFINITENESS

Claims 3 and 9 were rejected under 35 U.S.C. 112, second paragraph, for indefiniteness.

The wording of claim 3 was objected to for containing confusing wording, specifically the second recitation of the wording "to be coated". To overcome this objection the second and third recitation of "to be coated" has been canceled from claim 3.

It is believed that claim 3 now clearly states the limitation that the substrate is first activated (e.g. by plasma treatment) and/or a primer is applied to it before the easily cleaned surface coating is provided.

Basis for the limitation recited in claim 3 appears on page 6, line 16 to 19.

Claim 9 has been amended and two new claims 12 and 13 have been added to make the claiming of the recited alternative embodiments clearer. Claim 9 has been limited to an additional protective layer that comprises enamel. Claims 12 and 13 cover the additional alternative embodiments resulting from the presence of "and/or" in the original claim 9.

However it is noted that recitation of alternatives using "or" is generally acceptable in a single claim according to MPEP 2173.05 (h). Accordingly "or" is used in the new claims 12 and 13.

Study of the specification of the above-identified U.S. Patent Application indicated that explicit support for claim 9 in the description of applicants' invention was lacking. For that reason an additional paragraph regarding the additional protective layer has been added to page 17 of applicants' specification. This additional paragraph provides explicit support for the original claim 9 as well as the amended claim 9 and new claims 12 and 13.

For the foregoing reasons and because of the changes in the wording of claims 3 and 9, withdrawal of the rejection of claims 3 and 9 under 35 U.S.C. 112, second paragraph, for indefiniteness is respectfully requested.

Furthermore it is respectfully submitted that new claims 12 and 13 comply with the provisions of 35 U.S.C. 112, second paragraph, and are definite.

III. ANTICIPATION REJECTIONS

Claims 1 to 4, 6 to 8, 10 and 11 were rejected under 35 U.S.C. 102 (b) as anticipated by US 5,424,130 (henceforth called "Nakashani").

Claims 1 to 8, 10 and 11 were rejected under 35 U.S.C. 102 (b) as anticipated by US 5,624,625 (henceforth called "Takahashi").

1. The Claimed Invention

Note that applicants' claim an article with an easily cleaned surface coating. Also note especially that the claimed surface coating contains a metal oxide network and a hydrophobic substance and the hydrophobic surface is distributed uniformly across the thickness of the surface coating.

Thus when the surface coating begins to wear off so that its thickness decreases it still has the same good hydrophobic properties, heat resistant properties and contact angle as claimed in claim 1.

Also the objects of the invention on page 5 of applicants' specification state that the surface coating repels dirt, dust and grease and resists rubbing off. Also its properties do not noticeably change.

Claim 1 has now been amended to claim preferred embodiments of applicants' invention in which the hydrophobic substance of claim 1 is limited to embodiments including pre-condensed fluoroalkylsilanes. These hydrophobic substances are made by pre-hydrolyzing fluoroalkylsilanes at temperatures under 60°C while controlling the amount of water used in accordance with

applicants' description on page 11, line 11 and following, of the U.S. specification. Because of the use of pre-condensed fluoroalkylsilanes according to claim 14 the hydrophobic substances is distributed uniformly across the thickness of the surface coating. Because of this the repellent properties of the surface coating remain constant, even through substantial wear of the coating occurs which reduces its thickness.

In addition, claim 1 has been amended to state that the hydrophobic substance is integrated or distributed throughout the metal network. Basis for this change in claim 1 is found page 6, lines 10 to 11, of applicants' specification.

A new dependent claim 14 has been added, which limits the fluorosilanes of claim 1 to preferred silane compounds of formula I. This claim is based on the disclosure on page 10, lines 1 to 8.

2. Prior Art Generally

In contrast according to the prior art pre-condensed fluoroalkylsilanes (FAS) are not used to prepare the surface coating and an inhomogeneous distribution of the FAS is obtained across the thickness of the coating. Thus when the prior art coatings wear their surface properties change dramatically becoming poorer with increasing rubbing.

This analysis is supported by the comparative results in the specification in Table I on page 23. After 2000 load cycles (rubbing with a wet cloth) the contact angle of two examples of the coating of the invention has changed by no more than 10 %, whereas three examples of prior art coatings including one

including fluoroalkylsilanes, which are not pre-condensed, had reductions of contact angle by as much as 50 %. This clearly shows that the embodiments of applicants' coating containing pre-condensed fluoroalkylsilanes according to applicants' invention **are different and unexpectedly better** than the prior art coatings, which do not include pre-condensed fluoroalkylsilanes.

They are different because they have clearly different properties and because the hydrophobic substance, as claimed in applicants' claim 1, is distributed uniformly across the thickness of the surface coating. This latter feature that is included in claim 1 also distinguishes from the prior art.

3. IDS and J. Colloid and Interface Science Reference

An information disclosure statement with an additional prior art reference, H. Jeong, et al, J. Colloid and Interface Science **235**, pp. 130-134 (2001) accompanies this amendment. This prior art reference supports the above argument regarding the comparison between the wear properties of the surface coating of the invention, as claimed in applicants' claim 1, and the prior art coatings.

This J. Colloid and Interface Science reference describes experiments in which surface coatings were prepared on a glass substance by a sol-gel process using alkoxide solutions containing perfluoroalkylsilane and tetraethoxysilane. These coatings did exhibit excellent water-repellancy and were hydrophobic. However the authors of the article investigated the distribution of hydrophobic perfluoroalkyl groups across the thickness of these coatings experimentally by X-

ray photoelectron spectrometry (XPS) and SEM (see page 133, left column, and abstract). They found that in the case of the films that they made without pre-hydrolysis the surface coating is basically composed of two layers with the uppermost layer containing the hydrophobic groups, mainly PFAS groups. Coating thickness were around 100 microns.

The results of these articles bear out the above-described results of the applicants, which show that there is a substantial decrease in water repellence or contact angle with increasing wear on the coating in the case of the prior art coatings and that it is probably due to the removal of the layer with the PFAS groups.

4. Nakanishi

Nakanishi claims and discloses a water-repellant glass comprising a glass substrate and a water repellent film including metal oxides comprising SiO_2 and a hydrophobic substance (fluoroalkyl groups) according to claim 1 of Nakanishi. Film thickness of up to 100 microns is claimed (claim 11). Contact angle properties of applicants' claim 1 are similar to the contact angles for the freshly made coatings of Nakanishi.

However Nakanishi does not disclose or suggest the limitation that the fluoroalkyl groups are distributed uniformly across the thickness of the surface coating. This distinguishing limitation provides the basis for the constancy of the water repellency properties despite wearing away of coating material, as shown

by applicants' above-described tests.

Furthermore this uniformity feature is not inherent in the disclosed coatings of Nakanishi. Nakanishi employs rather dilute solutions of fluoroalkylsilane (FAS) in TEOS and ethanol without pre-condensation of the FAS, in accordance with the methods of the claimed invention. Because of that Nakanishi cannot obtain a uniform distribution of the hydrophobic FAS groups throughout the coating.

In the case of applicants' preferred embodiment the SiO_2 -sol gel solution is first condensed in a concentrated state and later diluted. In the concentrated state the SiO_2 sol is highly hydrolyzed and forms a colloidal dispersion prior to addition of the FAS. Then pre-condensed FAS is rapidly reacted with the SiO_2 sol, which leads to the uniform distribution of the FAS in the SiO_2 sol.

The corresponding coating mixture of Nakanishi would not produce coatings with a uniform distribution of FAS across the coating thickness. Nakanishi mixes all ingredients at the same time and since FAS hydrolyzes rather slowly it is not well dissolved in the resulting sol and in fact phase separation occurs. Thus there are unavoidable inhomogeneities in the FAS distribution throughout the coating formed by the methods of Nakanishi.

Thus the coating of Nakanishi does not have the property, as claimed in applicants' claim 1, that the FAS or hydrophobic substance is uniformly distributed across the thickness of the surface coating.

Regarding anticipation, first Nakanishi does not expressly disclose or claim this uniformity feature, as claimed in applicants' claim 1. Second, all the

experimental evidence gathered by the applicants and reported in their specification and also the evidence disclosed in the J. Colloid and Surface Science article shows that this latter property would not be inherent in the coatings of Nakanishi.

Furthermore Nakanishi does not require that his coating contains pre-condensed fluoroalkylsilanes, as defined by claim 1 and applicants' specification on page 11.

Thus it is respectfully submitted that Nakanishi cannot anticipate applicants' claim 1, or any of the claims dependent on it.

5. Takahashi

Takahashi discloses a glass article with a water repellant film. Takahashi creates a rough surface to produce a lotus effect. The water repellent film of Takahashi is a two-layer coating. The first base layer comprises a metal oxide network having peaks and valleys, which is free of hydrophobic material. The second or upper layer is a coating including hydrophobic material, especially FAS (fluoroalkylsilanes). See claim 1 of this reference, also columns 7 and 9. The preferred metals include Si, Ti and Zr and some organic materials are present in the first base layer, such as acetylacetonates.

In contrast the claimed coating of applicants' claim 1 is not a two-layer coating because the hydrophobic material is uniformly distributed throughout the thickness of the coating. The hydrophobic material must be integrated in or part

of the metal oxide network of the coating as well as distributed uniformly according to the amended claim 1.

Furthermore the presence of the roughened surfaces is completely undesirable for the application of the present invention because fatty material, fingerprints and food remainders might bake into these structures.

Thus Takahashi does not anticipate the article claimed in applicants' claim 1 for the same reason as Nakanishi, namely that, as claimed in applicants' claim 1, the FAS or hydrophobic substance is uniformly distributed across the thickness of the surface coating. Takahashi actually teaches and claims the opposite, namely that the coating is a two-layer coating with the hydrophobic substance in the upper layer and the metal network in the base layer.

For the foregoing reasons withdrawal of the rejection of claims 1 to 4, 6 to 8, 10 and 11 under 35 U.S.C. 102 (b) as anticipated by US 5,424,130 is respectfully requested.

For the foregoing reasons withdrawal of the rejection of claims 1 to 8, 10 and 11 under 35 U.S.C. 102 (b) as anticipated by US 5,624,625 is respectfully requested.


IV. CHANGES IN THE ABSTRACT

Some changes were made in the abstract to include the features of preferred embodiments, especially claim 14.

Should the Examiner require or consider it advisable that the specification, claims and/or drawing be further amended or corrected in formal respects to put this case in condition for final allowance, then it is requested that such amendments or corrections be carried out by Examiner's Amendment and the case passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing the case to allowance, he or she is invited to telephone the undersigned at 1-631-549 4700.

In view of the foregoing, favorable allowance is respectfully solicited.

Respectfully submitted,



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